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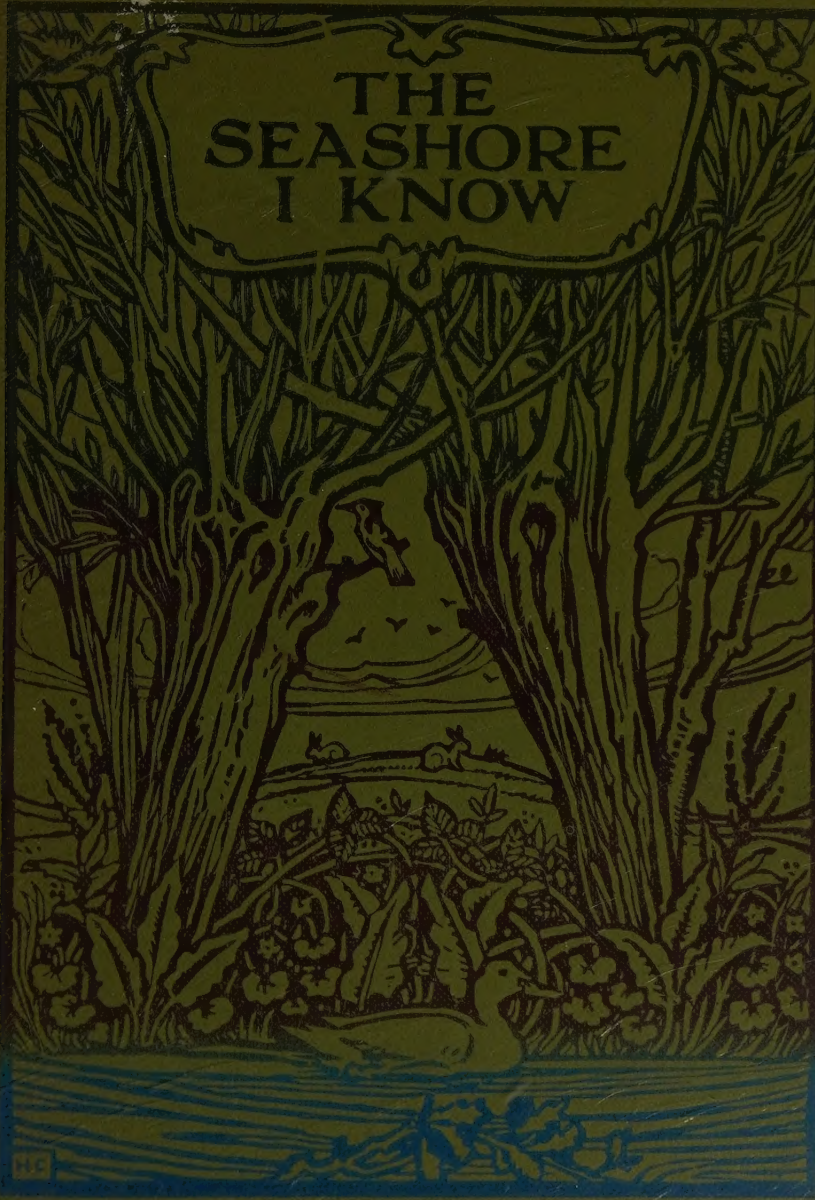

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EDITED BY

W. PERCIVAL WESTELL, F.L.S.

AND

HENRY E. TURNER

General Secretary of the School Nature Study Union

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THE SEASHORE I KNOW
(SAND DUNES)

THE
SEASHORE I KNOW

EDITED BY

W. PERCIVAL WESTELL, F.L.S.

& HENRY E. TURNER

General Secretary of the School Nature Study Union

WITH

8 COLOURED

& MANY BLACK AND WHITE ILLUSTRATIONS

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"There rolls the deep where grew the tree,
O earth what changes hast thou seen!
There where the long street roars, hath been
The stillness of the central sea."

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THE SEASHORE I KNOW

CHAPTER I

INTRODUCTION

FIRST IMPRESSIONS—ROCKS AND HOW FORMED—THE FORESHORE—ABUNDANCE OF MARINE LIFE—THE TIDES, THEIR CAUSES AND EFFECTS

PROBABLY few of us have forgotten that memorable day when, for the first time, we wandered along the shore and listened to "the sibilant splash of the seething seas." Maybe, however, those first impressions have long since faded and we cannot recall the particular moment when this "voice of days of old and days to be" first became part of the magic of our life.

And yet, in very truth, we might claim the sea as our special heritage! For are not we descended from those ancient vikings whose home was practically on the ocean blue? Have not these self-same waters guarded our shores for countless years and formed a rampart against our foes? And what of our enormous commerce made possible by those friendly waves which have borne our merchant ships from shore to shore? 'Tis true that from time to time we have had to pay the price—a heavy one maybe—but surely the balance has always been substantially in our favour?

The Seashore! What a variety of ideas those words conjure up in various minds! Some have visions of the bold

and rugged rocks of Cornwall; others call to mind the softer outlines of the chalky cliffs of Kent, which gave to England her ancient name of Albion ; others, again, are reminded of a sandy shore, or maybe a shingly beach, or even a muddy flat.

If only those rocks could speak—and remember that anything which forms the natural ground under the soil is a rock, whether it be clay, sand, chalk, coal, or granite—what fascinating stories they could tell! The granite might recall those far distant days when it was a hot molten mass pouring forth from an active volcano, and how it cooled down so slowly that its minerals had time to form into crystals—quartz, felspar, and mica. The chalk might explain how it was built up of the remains of microscopic animals which at one time lived at different depths of the sea ; when they died their remains accumulated as a deposit on the ocean floor; thus chalk is nothing more than soft ooze pressed and hardened into rock.

Clay is a form of mud, a fine sediment decomposed from rocks and carried by rivers and waves into the sea; pebble beaches are made up of whatever rocks are to hand for denudation by the sea, or are brought down by rivers or currents. So all along the shore we may see the results of water action, action so patient and constant that the hardest of rocks are reduced to powder by its persistent agency.

By the term fore-shore, we generally mean the land between high and low water mark, but Professor J. Arthur Thomson describes the shore as being the relatively shallow shelf where sea-weeds grow, which is not deep enough to be dark.

To whom does it all belong? Correctly speaking, the crown is the sole owner, but sometimes the lord of the

adjoining manor has a grant of a certain section of the shore which he may prove by such ancient use as the gathering of sea-weed. Here, then, the public must not trespass, although they may walk with perfect freedom on that part vested in the crown. The public have also a right to fish on any part of the seashore if they can get legal access to it; they may take all floating fish, but not Oysters or Mussels which adhere to the rock if the soil belongs to an individual.

Nevertheless, we need not concern ourselves overmuch with such legal matters as these; sufficient for us that we obtain the necessary time and opportunity for wandering among the rock pools, and studying for ourselves their curious and often uncanny inhabitants.

And if the coastal scenery be ever-changeful, so indeed are the conditions which prevail along these varied shores. Here the land, water, and air meet; here we have the ebb and flow of the ceaseless tides; here, it is said, the alternation of day and night is felt much more markedly than upon the open sea; here again the lapping waves may be angered into deadly breakers; or torrents of fresh water from rain or river may disconcert the dwellers of the salty pools.

Yet, in spite of these adverse circumstances, the extraordinary abundance of life is most striking. Watch the countless birds which circle and cry overhead, or mark the myriads of creatures which spring up at every footstep, and no one can deny that there seems to be a careless and extravagant profusion of life, the like of which does not exist elsewhere.

Who can wonder that with so dense a population, living under conditions of such eternal change, the struggle and competition for existence are most keen! "The Heron standing alert by the water's edge is on the outlook for fishes, which are on the outlook for shrimps, which are on

the outlook for still smaller fry, and so on it goes. The Oyster-catcher seeks with a neat stroke of its strong bill to knock the limpet off the rock; the limpet does its best not to be taken by surprise."[1]

Notwithstanding the multitude of creatures which wage this ceaseless warfare one against the other, and the moderate ease with which they can be studied, yet the number of students who show an active interest in this side of natural history is comparatively small. What is the reason? Miss C. von Wyss quaintly and delightfully explains it thus:

"It is probably because seashore things are 'so peculiar' that few desire their acquaintance. A peculiar thing is ever regarded with suspicion, and excites a feeling of intellectual discomfort. This, in its turn, is accounted for by ascribing to the unfortunate peculiar thing dangerous qualities which it may not at all possess, such as stings, poisons, and vicious intentions. There is no denying the fact that seashore life has disconcerting, irritating qualities. Watch the delicate spray of sea-weed swaying to and fro on the ripple of a sea-pool, pick it to take it home and it is a shapeless tangled mass, and the vivid colour is now quite dull—no fern leaf would do that. Notice the lovely sea-anemone clinging to a rock and waving its outspread tentacles—loosen it from its rock, it becomes a rounded lump of jelly with its greyish unsightly base swelling out in inflated humps, causing the creature to drift upside down in the can of water you have brought for its reception. There is a jelly fish drifting shoreward with the incoming tide, iridescent flashes of colour, rhythmical movement, and beauty of form, all combined give pleasure to the eye. Now it is stranded on the sandy beach, and in a short time it is a shapeless mass of loose jelly, and now it is but a little froth and foam and the sun and

[1] Thomson in *The Book of Nature Study*.

wind will efface the last traces. No creature of field or wood or air behaves like that."

Let us, therefore, put aside these unjust suspicions, and realise that although the denizens of the rock pools obey laws and follow customs apparently peculiar to themselves, yet that should excite our special interest rather than give rise to a sense of repulsion within us.

Surely the initial point that should arouse our curiosity is the regular ebb and flow of the seas, a movement known to us as the tides. At first glance, it would seem that the water reaches its highest level twice each day, and similarly each day witnesses two low tides. Further observation, however, would prove that this double rise and fall occupies close upon twenty-five hours, so that should high tide occur at noon to-day, the high tide of to-morrow would not happen until a few minutes before one p.m.

It was not long before men noticed the close connection between these movements of the ocean and the position of the moon, and gradually and laboriously the theories now in vogue respecting the tides were built up.

Matters will be considerably simplified if, for a few moments, we imagine the earth to be covered with water, and that it and the moon are stationary. Now the moon exerts a greater influence on the water nearest to it than it does upon the land, and therefore produces a bulging out of the water. Again, the moon's attraction upon the *whole* earth is greater than that upon the water on the opposite side; thus the earth is pulled away from that water, causing the latter to bulge out also.

Now drop the idea of a stationary earth, and remember that it revolves around its own axis once in twenty-four hours. We can then deduce that this double bulging out or tidal action must of necessity be continued round the

globe and take twenty-four hours to complete the journey. But meanwhile the moon has travelled onward, so that the earth has to make more than a complete rotation before it is again relatively in the same position with regard to the moon as it was before. The sun also plays a part in the matter of the tides, but that need not be considered here.

It must not be forgotten that the tidal wave merely rises and falls, and that although the *action* travels onwards, the *water* does not. Exceptions, of course, arise in narrow straits or estuaries, where the water becomes heaped up, so to speak, and may produce a more or less rapid rush forward.

"In the estuary of a tidal river," says Huxley, "the tide periodically agitates the water; and thus hinders deposition of sediment. The flow of the river seawards is, however, checked every time the tide comes in, and sediment is then deposited; hence *bars* or banks of sand are common at the mouths of rivers. The sediment which the tidal water carries away from the mouth of a river at one part of the coast may be deposited at another point, and thus the sea may become a constructive agent charged with the formation of new land. Usually, however, the suspended matter swept away by the ebb-tide is carried out to sea—where it may be caught up by currents and thus drifted to a great distance. Hence the tides and currents assist greatly in distributing the solid matter derived from the waste of the land."

In connection with this water action, let us consider why the sea is salt. Absolutely pure water does not exist in Nature, since it always finds something to dissolve even when falling through the air in the form of rain. Again, salt is one of the few substances which are nearly as soluble in cold as in hot water.

SEAWEEDS:

a. BLADDER WRACK *b.* IRISH MOSS

c. GREEN LAVER

A Rocky Shore

Now call to mind the great variety of rivers, which, having passed over all kinds and conditions of rocks, denuding here and dissolving there, finally pour their contents into the mighty ocean. But the latter has no outlets, and its surplus water—if so we may describe it—is got rid of by means of evaporation. Remember that this has been going on for countless centuries, and is it not quite natural to conclude that the sea water must be a much stronger "solution" than river water?

All salt, wherever found, has probably come originally in some way or other from the sea. The Great Salt Lake of Utah and the Dead Sea are examples of lakes without outlets at the bottom of which rock salt is forming.

CHAPTER II

SEA-WEEDS AND GRASSES

ALGÆ—OYSTER GREEN—GREEN LAVER OR SEA LETTUCE—BLADDER WRACK—SAND DUNES—MARRAM OR MAT GRASS—SAND LYME GRASS—SAND SEDGE

A WEED has been described as a plant growing out of its proper place, but no such definition is true of Sea-weeds. This vast family belongs to a sub-class of lower plant-forms, to which the name Algæ has been given.

Algæ live almost exclusively in water, either salt, brackish, or fresh, but can get on wherever there is a little moisture. Some are so small as to be microscopic; others so large as to turn the scale at a ton. Unlike the fungi, they possess that green colouring matter found in all flowering plants, and can therefore—under the influence of light—

avail themselves of the carbonic acid gas found in the atmosphere; they also obtain a certain quantity from water in which this carbonic acid gas is dissolved.

Algæ are best described in a negative manner, so great is the diversity of form they present. They do not rank among the highest type of plants since, like the Ferns, Mosses, and Fungi, they do not produce true flowers or seeds, neither can they boast of true roots, leaves, or stems, although some produce parts which more or less resemble them. The bundles of stringy threads so familiar in flowering plants, and known to be the food-carrying tubes, are absent in the Algæ, their structure being cellular, *i.e.* without any vessels.

Fig. 1. Algæ.
A, Coralline; B, Sea Grass.

Thus we can obtain some general idea of our Sea-weeds, but when we come to naming them, we are faced with a long and difficult list of high-sounding titles. Common names are almost unknown; let us therefore make a start by arranging them according to their colour, for this, strange to say, will practically prove a scientific classification.

The Green Sea-weeds are most at home on shelving rocky shores, and should be sought for in the rock pools. They are very slender, usually consisting of delicate filaments—sometimes attached to the rocks in fairly dense masses, sometimes swaying and floating quite freely in the water. There is a type of green sea-weed used by fishermen to cover the oysters when sent to market, and known as Oyster Green. Yet another type, known as the Green Laver or Sea Lettuce, consists of large green wavy fronds

Sandhills by the Shore

a. Star-wort or Sea Aster *b.* Sea Milkwort
c. Sea Convolvulus

firmly fixed to the rock, and is often used as an article of food.

The Red Sea-weeds prefer the deeper waters, that is, from low-water mark to the depths which are never exposed. They are sometimes left stranded in the shallow pools when the tide has retreated for a time. Their peculiar colour results from the fact that they contain an additional pigment which more or less completely disguises the green colouring matter common to all Algæ. Dr. Dukinfield Scott says, " The shade of colour produced by the combination of the two pigments varies much in different species, and in different conditions of the same plant. Sometimes a bright rose colour is the result, sometimes a rich purple, sometimes a reddish-brown, while in a few cases so little red colouring matter is developed that the green pigment becomes externally visible." The Red Laver and Irish Moss belong to the red group; both are edible and have been used as food. The well-known edible birds' nests of the Chinese are made of a red sea-weed.

The Olive-brown Sea-weeds are abundant everywhere, and are the kind best known to the casual observer. They choose rocks and stones, by preference, for their support, to which they are attached by a sucker-like disc; but they also make use of animals and plants, indeed the shells of mussels and snails are often completely overgrown by brown and red sea-weeds. They derive no nutriment from the support they rest upon; when loosened they continue to live in the water, and if they come into contact with a solid body are apt to attach themselves to it.

These brown sea-weeds delight in steep rocky shores, and vary in form from delicate filaments to shapeless masses. To this class belongs the well-known Bladder Wrack, which resembles a long ribbon with a thick mid-rib. Here and

there on its leaf-like fronds are swellings; these are hollow and full of air to enable the plant to float. Pimple-like structures can be seen at the tips of the branches, and are to do with the plant's reproduction. Brown sea-weeds played an important part in the once flourishing "Kelp" industry; this was especially true of the Wracks.

Fig. 2. Sand Lyme Grass.

In speaking of sea-weeds Lord Avebury says, "They attach themselves to the rock and grow towards the surface. The waves, as they pass, drag the sea-weeds with them, tear up the stones, and throw them on the shore. Some beaches are almost entirely supplied with pebbles in this way."

When we consider the vegetation of the seashore, we shall find it is as varied as the coastal scenery itself, for the majority of plants favour a particular habitat, apart from which they may become but feeble creatures, or even cease to exist.

Some of the lands which border on the sea have in times past been regarded as useless from a plant-sustaining point of view, mainly on account of

their sandy soil. Here the dunes have reigned supreme—those unstable hillocks which have been formed by the prevailing winds piling up the sand round some obstruction out of the reach of the waves.

Science, however, has come to the aid of these dreary stretches of waste land. Men by patient research and experiment have discovered the particular type of vegetation which can be introduced here with success. Chief among these are the Marram or Sea Matweed and Sand Lyme Grass, which, often in conjunction with Sand Sedge, not only flourish on a sandy soil, but by means of their underground stems spread themselves out in matted tufts and keep the sand from shifting, thus acting as sand binders.

Fig. 3. Sand Sedge.

Marram and such grasses were formerly used for mats and thatching, being of no use as fodder; but, of course, their greatest claim to our attention is their power of sand binding, thus preparing such soils for afforestation with bushes, and eventually with trees. An excellent example of this is to be met with in the Landes district of Western France.

There is another example nearer home, for the town of Hull is said to be indebted to this grass for its existence; the neighbouring sandbank, known as Spurn Head, has been given strength and solidity by Marram Grass, and thus retards the encroachment of the sea.

A covering of grass greatly affects the action of heat and sunshine on the surface soil; moisture is better able to be retained, radiation is retarded, and the soil is further prepared for future vegetation.

Grasses which flourish in sandy districts usually have

leaves specially adapted for dry conditions. In wet weather they spread themselves out and make the most of the temporary abundance of rain; but when contending with the pitiless sun and the dry winds, they coil snugly up and thus, by reducing the amount of exposed plant surface, protect themselves from too rapid transpiration.

It is not advisable at first to concern ourselves with the names and differences of the grasses we may find in this neighbourhood; such details are too technical for beginners. Reference might be made to the structure and universality of grasses as described in *The Meadow I Know*, page 15.

CHAPTER III

WILD FLOWERS OF THE SALT MARSHES

THE GOOSE-FOOT FAMILY—SEA PURSLANE—ORACHE—SEA BLITE — SEA BEET — GLASS-WORT — STAR-WORT — SEA WORMWOOD—THRIFT—SEA LAVENDER—SEA PLANTAIN —SEA MILKWORT—SCURVY GRASS

"THE marsh is bleak and lonely. Scarce a flower
Gleams in the waving grass. The rosy Thrift
Has paler grown since summer blessed the scene:
And the Sea Lavender, whose lilac blooms
Drew from the saline soil a richer hue
Than when they grew on yonder towering cliff,
Quivers in flowering greenness to the wind.
No sound is heard, save when the sea bird screams
Its lonely presage of the coming storm;
And the sole blossom which can glad the eye
Is yon pale Starwort nodding to the wind."

Here in these lines by Meredith we have a picture of our salt marsh, whose uninviting domain we are about to explore. Certainly this large tract of mud—the tribute of the neighbouring river, and penetrated at times by many a winding channel up which the tidal waters make their way—does

not at first appeal to us. At first glance, it would seem that Nature had been somewhat sparing in her gifts, but a closer acquaintance with this apparent waste will prove that even here there is much to see, much to admire, and much to learn.

True it is that many of the plants have a gaunt and tough appearance as though they had passed through times of great stress; for have they not borne the brunt of many a gale and faced the salt spray-laden winds?—foes which their inland sisters have not had to encounter. They are usually of a low growth and possess fleshy leaves, capable of retaining moisture.

According to Kerner, the salt observed on the leaves and stems of many of these plants has not been washed up or blown from the surrounding soil, but is produced from the substance of the leaves. He says it is excreted just in the same way as the crust of lime is from the Saxifrages; the saline solution exudes from various stomata, and in a dry atmosphere crystals form from it and adhere to the leaf; these crystals protect the plants during the hot hours of the day from excessive evaporation. It is as well to state that these opinions held by Kerner are not shared by many other leading authorities on the subject.

Most of you are aware that our plants are grouped into families or orders, although it is often difficult for a beginner to recognise the relationship between the various members of one such group.

In your walks abroad you can scarcely have failed to have noticed the plant called Good King Henry, so common is it on waste places and along the wayside. This is a well-known specimen of the Goose-foot family, and it is to this order that many of our salt-marsh friends belong. The ancient name of Goose-foot was probably bestowed by

some individual with a powerful imagination, who saw in its leaves a resemblance to the foot of a goose.

Fig. 4. Sea Blite.

The plants belonging to this family are usually unnoticeable and straggling. They possess dense clusters of small green flowers, for being fertilised by the wind they have no need to put on showy colours to attract insects; indeed, more often than not, they are coated with sand or dust. The order is a large one, and, apart from the wayside specimens, is composed chiefly of succulent salt plants either growing by the seashore, on salt marshes, or in deserts and steppes. Strange to say, a few are cultivated as vegetables, such as Spinach and the Common Red Beet. The following five species should be sought for:—

1. The Sea Purslane. This reaches a height of from twelve to eighteen inches, and flowers from August to October. Its lower stems often creep along the ground, and by taking root strengthen themselves against the gales. Its flat fleshy leaves are almost oval in shape, and they—and indeed the whole plant—are closely covered with grey scales which cannot be rubbed off. Formerly the leaves were used as an article of food after they had been preserved in salt or pickle.

Fig. 5. Sea Beet.

2. The Orache may be described as the cousin of Sea Purslane. The whole plant is of a deep green colour, but is often tinged with red. Frequently it has the

appearance of having been dusted with fine meal. The stems are furrowed, the main one usually being erect and the others branching downwards. The leaves are triangular and toothed.

3. Sea Blite. Here again the flowers are in little green clusters nestling in the axils of the leaves. The latter are small and strap-shaped, fleshy in texture, and semi-cylindrical. The plant often turns red or purple in the Autumn.

4. Sea Beet. This is the parent of the red and white Beets, and of the Mangel Wurzel so beloved of cows. Those leaves which spring from the root are glossy, have long stalks, and are triangular in shape; it is said that when boiled they are as good as Spinach. The upper leaves are narrower and possess shorter stalks.

Fig. 6. Glass-wort.

5. Glass-wort. This, the last and strangest specimen of the Goose-foot family which we shall deal with, is the one that creeps the farthest towards the sea. It is entirely destitute of leaves, and may be described as consisting of green fleshy joints each of which fits into the one below. The flowers, which appear from June to October, are of the type peculiar to this group.

One of the handsomest plants which grace our seashore is the Sea Aster or Star-wort. This is similar in appearance

to the Michaelmas Daisy; indeed it belongs to the Daisy family, and is therefore a cousin of the Dandelion, Colts-foot, Sun-flower, etc. The yellow centre of the flower head consists of tube-like florets, crowded together in unsuspected numbers, and each capable of shedding pollen and producing seed; the florets forming the outer ring are arranged in a single row; they are purple in colour and strap-shaped.

Fig. 7. Sea Wormwood.

Another member of the Daisy family to be met with in this region is the Sea Wormwood. The flower heads are reddish-yellow and are arranged in small clusters all the way up the stems. The leaves, which have white down on both sides, are divided into very narrow and numerous blunt segments and have a strong aromatic odour when bruised.

Probably all of you will be able to recognise Thrift or Sea Pink. It was christened Thrift because it possessed the power of living where nearly every other plant would starve. The leaves resemble grass, and, rising direct from the root, form a cushion-like tuft; the Germans speak of the plant as Sea Grass. The flowers are pink—rarely white—and are grouped in a globular head at the end of a leafless stalk. Each head is encircled and protected by a tough scaly case, part of which is prolonged downward to form a sheath half an inch long around the stem.

Thrift can be used as a border for our garden, and this is probably where you have seen it. Here it will flourish though miles away from its salty home; indeed cultivation and more congenial conditions appear to make it proud

and lazy—fine flowers being produced, but scarcely any seed; in such a case propagation is largely carried on by dividing the roots.

Growing in the same neighbourhood we may discover a hardy cousin of Thrift, known as Sea Lavender. This also bears removal very well and will flourish in gardens. The lance-shaped leaves with their long stalks form a dark green rosette, since all rise direct from the root. Each leaf is marked by a strong mid-rib with a short point at the tip.

Fig. 8. Sea Plantain.

Fig. 9. Scurvy Grass.

From the centre of the rosette springs up the leafless flower-stalk, crowned with spikes of lilac-coloured flowers arranged in rows, and apparently thrown off from one side only of the stalk. When the plant is in blossom and is spread over large tracts, one is reminded of moorlands and heaths covered with purple heather.

The Sea Plantain is a stemless plant with small green flowers forming a cylindrical spike. It can be distinguished from other Plantains by its narrow strap-like leaves, which are grooved and woolly at the base.

One would scarcely expect to find a relative of the

Primrose amongst the vegetation of the salt marshes; yet such is the case, for here the Sea Milkwort flourishes. This low-growing glossy plant, which is rarely more than six inches high, can be found in thick patches among the grass, and is covered with small oval stalkless leaves. Should the necessity arise, it could force its root-fibres between the layers of the surrounding rock.

Unlike all its cousins, its blossoms have no corolla, but consist of a bell-shaped calyx formed of five pink sepals. Each flower grows separately, and nestles in the axil of a leaf.

One other plant should engage our attention before we quit this locality, to wit, Scurvy Grass. Do not let the name mislead you into thinking it is a Grass. It received this title in the days before steamships, on account of its frequent use by sailors suffering from scurvy, that disease being caused by the great difficulty of obtaining fresh vegetables during a long voyage. The smooth dark green leaves—heart or egg shaped, according to their position—can endure a very considerable cold without the slightest injury. Like its cousin, the Wallflower, its flowers, which are white, consist of four sepals and four petals.

CHAPTER IV

WILD FLOWERS OF THE SANDY SHORE AND CLIFFS

SEA ROCKET—SALT-WORT—SEA HOLLY—SEA CONVOLVULUS — HOUND'S-TONGUE — SEA BUCKTHORN — YELLOW HORNED POPPY—SAMPHIRE

A SANDY shore seems almost as unpromising a hunting ground for the botanist as the mud flat; nevertheless those who seek there will surely find. Here, for instance, flourishes the Sea Rocket, so often described as the Sea Stock, owing to the close resemblance of its flowers to those of the garden variety. It grows from one to two feet high, and has a special feature in its zigzag branches.

Fig. 10. Sea Rocket.

The leaves vary in form, some being entire—that is to say, not split up—and others lobed; they are also smooth and of a sea-green colour.

Even a brief examination of its delicate lilac-coloured blossoms will reveal its relationship to the Wallflower; the four petals and the succeeding pod must therefore be looked for. At first, these blossoms are borne on comparatively small stems and nestle more or less among the leaves. Later on, the stem lengthens and the pods become conspicuous; these in turn decay, and the seeds are then set free to remain dormant in the sand until the following Spring.

We frequently notice as we examine the leaves of our

maritime plants that they have been modified to suit their particular environment; indeed, these plants which struggle for existence in dry places find it necessary that they should be able to absorb moisture whenever opportunity offers, and store it up for future use. It is then that fleshy stems and leaves prove of such great use, and, again, leaves reduced in size are often the order of the day.

Would it not prove an interesting study to gather leaves of all shapes and from all parts, and to endeavour to puzzle out the why and wherefore of this infinite variety? Writing on this subject Ruskin says, "The leaves of the herbage at our feet take all kinds of strange shapes, as if to invite us to examine them. Star-shaped, heart-shaped, spear-shaped, arrow-shaped, fretted, fringed, cleft, furrowed, serrated, sinuated, in whorls, in tufts, in spires, in wreaths, endlessly expressive, deceptive, fantastic, never the same from footstalk to blossom; they seem perpetually to tempt our watchfulness, and take delight in outstripping our wonder."

The peculiarity of reduced leaves is seen in the Saltwort, a somewhat prostrate plant from six inches to one foot high. The small stalkless flowers are placed in the axils of the awl-shaped leaves, each of the latter ending in a spine. The whole plant is more or less hairy and has an angular and striped stem.

Another prickly plant which is often met with on sandy shores is the Sea Holly. The rootstock spreads freely and sends up sturdy hairless stems, which may reach a height of eighteen inches.

The leathery leaves are often five inches across, and protect the stem and roots from the fierceness of the sun. These leaves have a crumpled appearance, but their margins are tough and their lobes have spines—hence the popular name of the plant; probably these spines protect the

plant from the inroads of those animals which might otherwise take a fancy to the leaves.

The flower heads appear during July and August, and at first suggest a Thistle; they are of a beautiful lilac-blue colour, and consist of a number of florets massed together in a somewhat spherical head, protected by a number of spiny bracts.

One would scarcely expect to find a Convolvulus growing in this neighbourhood, yet such is the case. The Sea Convolvulus does not climb, for its short stems, often only a few inches long, lie almost entirely buried in the sand. The leaves are small and shaped like a kidney, with round or angular lobes at the base. The flowers are trumpet-shaped, with a diameter of about one and a half inches; they are of a purple-rose colour with crimson or yellow stripes.

Fig. 11. Hound's-tongue.

What remarkable names plants often possess, and what little reason there often seems to be that such names should have been bestowed upon them. How many leaves, for instance, resemble the tongue of a dog!—yet here we have a plant which, apparently for no other cause than the shape of its leaves, has been singled out to bear the name of Hound's-tongue. It is only fair to add, however, that the leaves of this plant bear an additional resemblance to a dog's tongue in so far as they are rough. Although the origin of the name is questionable, there is no doubt that the plant is held in general disrepute. Its lurid appearance and offensive smell—an unpleasant odour suggestive of mice—keep both cattle and insects at bay.

The thick erect stem rises to a height of two feet, and is clothed with stiff hairs; indeed, hairiness is the characteristic of the whole plant, giving it a greyish appearance. The stalked leaves which rise from the root often reach a foot in length, and somewhat resemble a broad lance.

The dull crimson flowers, each with its five sepals and five petals, appear in June and July, and are funnel-shaped, measuring almost half an inch across. "When the corolla has fallen," says Step, "the gaping calyx discloses four flattened nutlets with the margins raised and thickened, and covered with short stout hooked spines, that enable them to cling tenaciously to fur, feather, or textiles."

Fig. 12. Yellow Horned Poppy.

Sea Buckthorn should also claim our interest. It is a spiny shrub some four or five feet in height with a silvery scaly bark. The leaves are very narrow, and they, too, have a silvery appearance. About May the small green flowers appear, to be succeeded later on by juicy berries of an orange tint.

Probably the most conspicuous plant that grows on our shores and cliffs is the Yellow Horned Poppy, for not only is its colour most pronounced, but it contrives to blossom from June to October.

The plant is fairly sturdy, and exudes a yellow juice with rather a disagreeable smell. Although it does not reach a great height, it often covers a considerable space by reason of the number of its widely spreading branches. The rough sea-green leaves are lobed, and clasp the stem at their bases; being of a leathery texture, and covered

with short thick white hairs, they are better fitted to face the storms that so often rage in their neighbourhood.

The blossoms, which measure from three to four inches in diameter, are borne on a short stem springing from the axil of the leaves. As in the case of the Scarlet Poppies, so here the two sepals drop off as soon as the four petals have spread themselves out—and these in turn soon fade. Then it is that the cylindrical pods appear, which reach the unusual length of ten to twelve inches; these give the plant its name of "horned," and might at first be taken for stems deprived of their flowers.

Have you ever read these lines from *King Lear?*

> "How fearful
> And dizzy 'tis to cast one's eyes so low!
> The Crows and Choughs that wing the midway air
> Show scarce so gross as beetles; half way down
> Hangs one that gathers Samphire, dreadful trade."

Herein one gets a wrong impression as to where Samphire grows, for although this aromatic plant is a native of the sea cliffs, it thrives on crags and rocks quite easy of access. The short zigzag stem and very much divided leaves suggest Mistletoe; indeed the whole plant has a fleshy appearance, and the thick leaflets remind one of fingers.

The pale greenish-yellow flowers grow in numerous clusters on short stalks; these unite at a point on larger stalks, and a series of the latter also have a common starting point on the main flowering stem; this arrangement gives the plant the appearance of a group of small floral umbrellas uniting to form a larger compound one. Wherever these rays—corresponding to the ribs of an umbrella—join, there is a ring of small narrow bracts.

CHAPTER V

SEA BIRDS OF THE CLIFFS

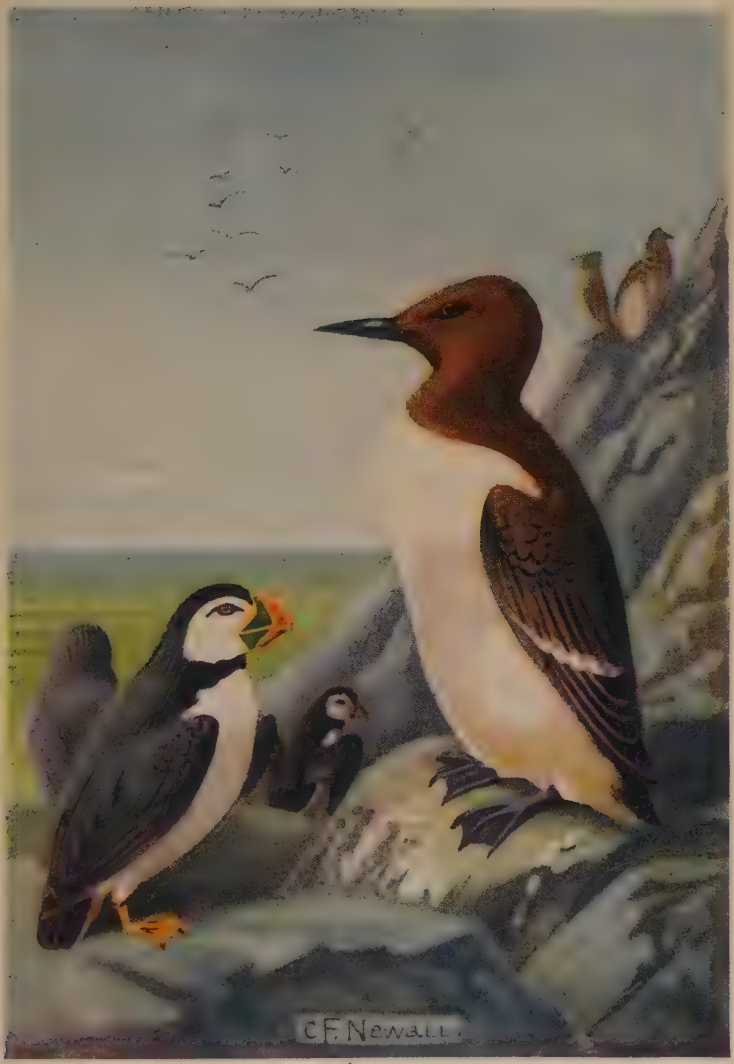
COMMON GUILLEMOT—GANNET—RAZORBILL—PUFFIN—KITTIWAKE GULL—CORMORANT—SHAG

THE sea birds which as a rule are to be seen upon the cliffs are very unlike those which we shall discover when next we set out along the shore.

Nearly all cliff-loving sea birds have large bodies, strong beaks, and webbed feet. With the exception of the Gannet, the seven different kinds of birds with which it is desirable you should be acquainted, and to whom we propose to introduce you in this chapter, are not really good fliers, neither are they facile walkers. For the most part they pass their time sitting upon the bare rock sunning themselves, cleaning their feathers, sleeping, hatching their eggs, or they swim or dive in the sea after various kinds of fish upon which they live.

The first bird we have to mention is the Common Guillemot; it is necessary to call it the Common Guillemot so as to distinguish it from its rarer and smaller cousin, the Black Guillemot, which is only found on a few parts of our rocky sea-coast.

The Common Guillemot is about the size of a small Goose, and is dressed in a suit of dark brown and white. It has a dark cap and gown, with a pure white waistcoat, and when a number of these birds are sitting on a rock facing the sea they look very curious. They rather resemble a number of feathered choir boys with their surplices on, but, alas! their voices are not at all melodious, for they utter laughter-



PUFFIN COMMON GUILLEMOT

Sea Purslane

Orache

like as well as hoarse notes, and sometimes bark in a manner similar to that of a dog!

The strong beak enables the Guillemot to catch fish, the bird being very fond of sprats.

It does not build a nest, but places the one large pear-shaped egg on a ledge of the cliff. Thousands of these birds occupy the same part of the cliff, and their eggs are so close together that one wonders how each bird knows its own egg. If a number of eggs be looked at, however, it will be seen that no two are exactly alike; here, then, Nature has provided a means whereby one egg may be distinguished from another.

As a rule, the ground colour is pale blue, green, yellow, or even white, marked with handsome blotches of a darker colour. In shape the egg much resembles a pear, being very pointed at one end. The reason for this seems to be that when the wind blows, the egg, not being round, is less likely to roll off the cliff and be dashed to pieces on the rocks below.

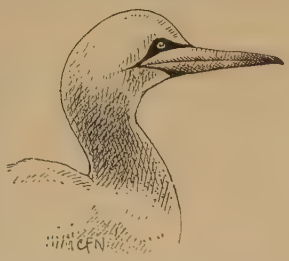


Fig. 13. Head of Gannet.

When spending a holiday on a rocky coast be on the look-out for a large silvery-white bird, which some people call the Channel, or Solan, Goose. It isn't a Goose at all, and its proper name is Gannet.

This is a typical bird of the rocks and cliffs, and, like the Guillemot, it lays only one egg. This, however, is very different from that of the Guillemot, for it is of equal proportions and is all white. The Gannet does build a nest, although it is rather an untidy one. The materials used consist of sea-weed, straw, and grass, and, in course of time,

the egg becomes stained. It is covered with a chalky substance which can be scraped off.

The bold Gannet is a wonderful bird upon the wing, and to see it fishing is a sight not easily to be forgotten. It flies high in the air, with the head and neck pointing towards the sea beneath. That the bird is able to spot a fish from a high altitude seems quite certain, for, if a patient watch be kept, it will be seen to dash down head foremost into the water, making a rare splash as it does so, and capturing a fish in a most marvellous way.

When the sun is shining, the clean-cut silvery wings of the Gannet in flight are to be plainly seen; it will keep fishing for hours at a stretch, rising and falling until it is finally lost to view. Like the Guillemot, it has a fondness for sprats, but also feeds on mackerel, herrings, and pilchards.

Once upon a time there lived in Britain and elsewhere a very curious looking bird called the Great Auk. It does not seem to have been shot, trapped, or caught, and yet, in spite of this, it has become extinct within recent times. So rare are its eggs that £300 has been paid for one of them, and a stuffed specimen of the bird itself is worth, it is said, £1000.

Now upon the rocks we may see to-day the nearest living relation of the Great Auk, and its name is the Razorbill. It cannot very well be mistaken for any other bird, for its plumage is dark on the upper parts and throat, with white underneath; for instance, you are not likely to mistake it for a Guillemot, for although it is about the same size, the curious black, axe-like beak with a white, crescent-shaped mark across the deepest part, is very distinct.

Rocky sea cliffs, where there are holes and crevices, are sought after by the Razorbill wherein to place her one egg. No nest is built, the egg being laid on the bare rock. It is

Sea Holly

OYSTER-CATCHERS (above)
HERRING GULL (below)

white, or buff, in ground colour, marked with spots and blotches of dark brown. Really the egg resembles, on a small scale, that of the Great Auk, as an examination of specimens at South Kensington Museum will reveal.

The Razorbill, like all other sea birds, is no songster, and all it can do is to croak and grunt.

One day when walking over the cliffs you may be fortunate enough to see a small black and white bird about the size of a Parrot. If you watch the bird strutting about you will probably be struck with its awkward movements, and, should the time of the year be Spring, the bright and curious beak will be sure to attract attention. What really happens is that, during the pairing season, the male Puffin, for such is the bird's name, grows a sort of false " nose." It is blue, yellow, and red in colour, and seems all out of proportion. It is because of this beak that the fishermen call the bird the Sea Parrot, whilst other names that have been given to it are those of Knife Bill, Tommy Noddy, Tommy Tomnoddy, and the young bird is sometimes called the Willock.

The Puffin is rather particular as to where it places its one white or ash-coloured egg, in order that it may contrive to put it out of sight. A hole in a rock is often chosen, but on some islands, where the soil is made up of peat, and therefore soft, it makes a burrow in the ground and places the one egg at the end of it.

It is most interesting to see Mr. and Mrs. Puffin sitting side by side at the entrance to their home; sometimes Mr. Puffin only is acting the part of sentinel, Mrs. Puffin being inside. If one puts an arm in the burrow to see if Mrs. Puffin is at home, he may have something to remember his temerity by, for a sharp stab from such a strong beak as the bird possesses will cause one to retreat in double-

quick time. Like the Razorbill, the Puffin feeds upon small fish.

The seashore without various kinds of Gulls might indeed prove a lonely place; to whatever part of the rocky coast we go for our holidays in the bright days of Summer, there, sure enough, a few, or many, Sea Gulls will be found. If a careful watch be kept upon the ledges and shelves of the rocks and cliffs, the Kittiwake Gull ought to be discovered. It is our smallest British Gull, and may be known by its silver-grey jacket and white waistcoat. Bear in mind, too, that the beak is greenish-yellow, and that the legs and feet are black. To take notice of the colour of the beak, legs, and feet of Gulls is a capital way to get to know their names.

The Kittiwake Gull is so called because of its three notes which sound something like its name, whilst they have also been compared to the words, " Ah-get-away, ah-get-away." We wonder if that is what the Kittiwake really does say when we wander near its haunts.

The nest is placed on the ledges of rocky sea cliffs, and is built of sea plants, with a cosy lining of grass. Three stone or olive coloured eggs are laid, and these are blotched and spotted with ash-grey and brown.

When fishing, this Gull reminds one of the graceful Terns. The Terns exhibit such beautiful movements in the air that these birds are called Sea Swallows. They hover over the water at a height of about twenty or thirty feet, with the head held downwards, and the wings beating slowly, so as to keep the body in motion. Then, when a fish is seen near the surface of the water, the bird takes a headlong dive without the slightest hesitation; there is a splash, and the bird emerges, triumphantly bearing a fish in its bill.

There are two more rock-dwellers among our bird friends which remain to be mentioned, and as they are very much alike, and closely related, we may treat of them by way of comparison. One is known as the Cormorant, the other as the Shag.

The Cormorant is the larger of the two, measuring about thirty-six inches in length, the Shag being about ten inches less.

The Cormorant is dark coloured all over, except for a white patch on the throat; it has a crest in the Spring, and also a white mark on the thigh. Unlike most birds, the female is brighter in colour than her mate, has a finer crest, and is larger. The Shag also is dressed in a mourning suit, but, when seen in a good light, it will be observed that, whereas the Cormorant is bronze-brown, the Shag is dark green, with purple and bronze reflections. Both birds feed on fish, and the Cormorant especially is a splendid diver. But it does not soar in the air, or hover over the surface, after its prey, for it swims in the water and every now and again disappears underneath without any fuss or commotion.

Its body seems as if made of elastic, so lissom is it, and the bird is able to keep below the surface for some considerable time. It loves to capture flat fish, but will also feed on eels.

The Cormorant has many local and old-fashioned names, one of which is Isle of Wight Parson, whilst the Shag has been similarly christened, and is also known as the Crested Scarf.

Four to six whitish eggs are laid by the Cormorant, whilst the Shag produces three to five. They soon become stained in the wet, untidy nest, and it must certainly be admitted that both kinds of birds are not at all clean in their habits.

The Cormorant loves to sit on a rock for hours at a stretch sunning its body after its fishing excursions are over, and although the tide may be coming in, and the salt spray dashing quite close, the bird dozes and suns itself until it feels it is time to wake up.

CHAPTER VI

SEA BIRDS OF THE SHORE

HERRING GULL—BLACK-HEADED GULL—RINGED PLOVER—OYSTER CATCHER—REDSHANK

THE sea birds which may be observed along the shore, either wading in the pools left by the tide or perched in little companies upon the rocks, are somewhat more interesting than those which we discovered on the cliffs. The reason is that the birds of the shore are more active and their movements can, in consequence, be better watched.

Whilst a few of them, such as the Gulls, are web-footed, the majority are Waders, whose business it is to search for food among the sand and mud, or in the rock pools; there various kinds of marine creatures are in hiding until the tide comes in again and releases them—that is, of course, if the sharp eye of a bird has not already discovered them.

Before we have a peep at a few of these wading birds, however, let us take notice of the Gulls, for we shall find at least two species fairly plentiful. One is the handsome Herring Gull and the other is the Black-Headed Gull.

With the exception of the Great Black-Backed Gull, the Herring Gull is our largest British species, for it measures

about twenty-four inches in length, and is a plump, well-built bird, which you ought to get to know.

As we take our ramble along the shore we may probably discover little groups of Herring Gulls gathered together in solemn conclave, as if they were discussing some important problem which required deep thought and attention. Yet they are strangely quiet, and it is only now and again that one of the feathered gathering gives voice. When he does so, one hears a series of laughter-like notes, as if the bird were in high glee.

A careful survey of the group of Gulls before us will reveal a good deal of interesting information, so far as concerns the plumage, for there always appear to be some individual birds which have not attained the adult dress. These are what are called immature birds, that is, young and middle-aged specimens, which are dressed in a garb different from that of their parents.

It needs a practised eye to tell what species these immature Gulls belong to, but the grown-up parents can soon be picked out, as the flesh-coloured legs and feet, strong yellow bill, grey coat, and white head, tail, and under parts, with some black on the wings, are all useful aids to identification. The grey coat has resulted in the Herring Gull also being known as the Silvery Gull, whilst some of its curious cries and calls no doubt account for another local name of Cat Gull.

When the tide goes out and leaves mud banks and saltings clear of water, then the birds of the shore, including the Waders and Gulls, commence to search for food, and whilst the Herring Gull is, as its name implies, fond of fish, it also eats insects, worms, refuse which is found by the seashore, and even eggs and young birds.

It nests during May and June, placing its homestead on

the ledges of rocks as well as on grassy cliffs. Three eggs are laid, and these vary in ground colour from yellow to green or brown, blotched with ash-grey and dark brown.

Unless seen in the Spring or early Summer, the probability is that the Black-Headed Gull would not be easy to identify, because the dark brown cap is worn for only a few months in the year. Traces of it may be seen in Autumn but in Winter it entirely disappears.

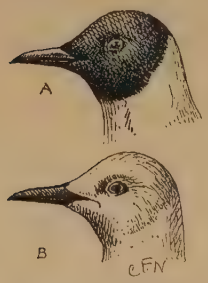


Fig. 14. Head of Black-Headed Gull. A, Summer; B, Winter.

During the nesting season, the Black-Headed Gull resorts to inland lakes of fresh water around which it nests in large colonies. It also haunts fields, moors, and other places, and will follow the plough after worms and insects in the same way as Rooks, Jackdaws, and Starlings.

Very little attempt is made to build a nest—a few pieces of dead grass and sedge being got together—and in this frail cradle three eggs are deposited. These vary a great deal, and may be any shade of green, yellow, blue, or brown, and whilst some are strongly marked with dark spots, others only contain a few such patches.

The red bill and feet—hence a local name of Red Legs—and the blackish-brown head in Spring and Summer, are means by which to identify this species. The rest of the plumage is white, with a pink tinge on the breast and belly.

If we were asked to mention a bird which was especially characteristic of the shore we should not hesitate to vote for the Ringed Plover. True enough, it is also called Dull Willy, but that it is by no means dull those who observe it will soon discover. It is a wonderful flier and one of the fastest birds we have ever seen on the wing.

It is dressed in a quiet suit of light brown and buff, with

a black forehead and collar, and orange-coloured bill and feet. It has a somewhat flat head, and when the parent bird is sitting on the eggs the black collar can be readily noted if looked at through a pair of field-glasses; otherwise this species might very easily be overlooked altogether.

In some other parts of Britain the Ringed Plover is called Wide-awake, as well as Sand Laverock, Sandy Loo, Shell Turner, and Stone Runner.

These local names are interesting because they convey an idea of some of the habits of this engaging bird. It runs about the shore in a most delightful way, as its name of Stone Runner indicates, reminding us of a large Wagtail; it turns shells over when it is hungry and is seeking a meal—hence Shell Turner.

It lives upon marine insects, worms, shrimps, and similar creatures, and loves to dabble on a mudbank, where its footprints can be noted to advantage. Those fond of tracking birds would do well to visit a sandy or muddy seashore where they will find various marks of interest.

The eggs are, as a rule, laid on the bare shingle, or among stones, sometimes in a field close to the shore, or among sand. They are distinctly pear-shaped, yellow in ground colour, closely freckled with black. They are very pointed at one end, tapering off almost to a point in some specimens.

Sometimes a few pieces of shell are gathered together to serve as a nest, but little attempt is made at nest-building, for the eggs and young birds are difficult to discover, and the babies run about soon after they hatch. There is, therefore, no need to build a nest as is the case with a bird which frequents a hedge or tree.

There is a large black and white bird which is often to be seen along the shore. It has a prominent orange-coloured bill, with purplish-pink legs and feet. When it is alarmed, it

cries in a shrill voice as if it had made up its mind to utter a warning to all its companions that danger threatened. As a matter of fact, there is little doubt that this black and white bird, the Oyster Catcher, or Sea Magpie as it is called, is one of the chief sentinels of the seashore. So soon as it utters its shrill cry, or piercing whistle, the Gulls, Plovers, Redshanks, Curlews, and other birds are on the alert; indeed the Oyster Catcher acts the part of a feathered scout very successfully.

When it is put to flight it usually flies a little way out to sea, and then hugs the shore, so as to alight at a new place on land not far away. Like the Redshank, the Ringed Plover, and the Curlew, it flies only just above the surface of the water.

Curiously enough, although called Oyster Catcher, this bird does not feed upon Oysters. It certainly includes various kinds of small shell fish in its bill of fare, but it will also take shrimps, marine worms, and other small creatures which make their home in or by the sea.

Some people call it the Mussel Picker, and it may, and probably does, eat mussels, which it is better able to secure than oysters, even if it were disposed to feed upon the well-known shell fish after which it has been named.

Hardly any attempt is made to build a nest, the three handsome eggs, yellow, marked with ash and dark brown, being laid on rocks, or among rough shingle.

There is a bird about as large as a Mistle Thrush, but with long red legs and a red bill, to be met with along the shore, to wit, the Redshank. It runs about as if on stilts, and every now and then bobs its body up and down and reminds us of the habits of the more familiar Robin of our lanes and gardens.

When we are walking along the shore we may hear a

series of three shrill notes constantly repeated by these birds, and if we keep a sharp look-out, we may discover three or four, or maybe half a dozen of them flying rapidly just above the waves. If we follow their movements, and we must be very keen-eyed to do so, we shall find that they have alighted further along the shore, and, as they do so, they bob up and down as if their legs were too long for them, and they wanted to make quite sure that they had really landed safely. These, then, are Redshanks, or Red-Legged Horsemen, as they are sometimes called.

There is something about this typical seashore bird which is much in keeping with the haunts it frequents. It is as restless as the waves in its movements, and when it utters its shrill cry it fits in quite well with the wild, weird music of the ever-murmuring sea.

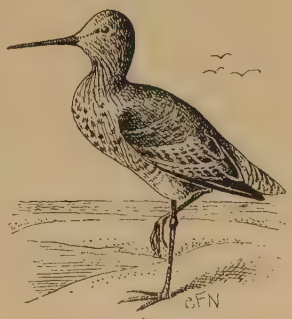


Fig. 15. Redshank.

The general plumage of the Redshank is various shades of brown, but when in flight there is a prominent patch of white to be seen near the tail, which makes it an easy matter to identify it.

Though resorting to the coast during late Summer, Autumn, and Winter, the Redshank is fond of nesting inland, a reed-fringed lake or pool being a favourite resort. It loves marshy ground where it can probe in the mud or ooze with its long, strong bill after insects, worms, small crustaceans, and other creatures. The long legs enable it to wade in the water, and to run rapidly over banks of soft mud, and the beak is a splendid instrument by means of which food is obtained.

The nest is not a wonderful structure, consisting as it does of dry grass, a little moss, and perhaps a few sprigs of heather. Very often, however, the reeds and sedges are merely trodden down into a flat sort of cradle. The four eggs are cream-coloured, speckled and spotted with dark brown. Like those of the Ringed Plover, the Dunlin, and other birds of a similar nature, these eggs are very pointed at one end, a remark which applies more or less to most birds that lay their eggs upon the ground. One of the reasons for this seems to be that, as very little, if any, attempt is made to build a nest, it is essential that the eggs should be of such a shape that, when all of them are placed together, they occupy only a small space; thus the parent bird can completely cover them when sitting, and successful hatching is the result.

CHAPTER VII

FISHES OF A ROCK POOL

SMOOTH BLENNY—BLACK AND SPOTTED GOBIES—FATHER LASHER—PIPE FISH

To explore the mysteries of a rock pool is a delightful occupation, and many pleasant hours may be spent searching for the various interesting inhabitants which make their home in such a place.

If one passes by a rock pool without taking the trouble to examine it properly, the probability is that little, if any, life will be seen in it, but if, on the other hand, a careful examination is made, a whole host of wonderful creatures will soon be discovered.

Some will be found lurking under the stones at the bottom of the little pool, others will be taking cover beneath a shelf of the rock, and some are so quick of movement, and so closely resemble their surroundings, that it is most difficult to detect them.

On this excursion, we want to make acquaintance with just a few small fishes which may be found in a rock pool, and we cannot do better than make a beginning with the Smooth Blenny, or Shanny as it is also called. This little fish is an adept at hiding its body, for it seems to hate being watched. It hides under a stone, or rock, and will even burrow in the sand. It is a curious-looking tenant of our rock pool, having a large Frog-like head, and sharp spines on the fins which can prick one's fingers severely. It varies in colour to a wonderful extent; it may be green and yellow, olive-brown, or even black, but if the eye be looked at a ring of bright red will be seen which is perhaps sufficient to identify it.

Fig. 16. Smooth Blenny.

In many ways the Smooth Blenny is worth studying, for, having gills which retain moisture for some time, it can, and does, remain out of water for several hours without dying. In consequence of this the fish can, if left high and dry by the tide, remain unhurt until the tide comes in again and releases it.

Then this little fish has the power of moving its eyes independently of each other, for, whilst one eye is being moved, the other often remains still, or can be turned in an entirely different direction.

There are two species of fish in our rock pool which should most certainly be sought after, and they are known by the curious name of Gobies. You may soon recognise these Gobies if you will look at the lower fins, for these are shaped like a sucker, and by means of them their owners are able to cling to a rock, and so anchor themselves.

The Black Goby and the Spotted Goby are two of the commonest to be found round our shores. A word of warning must be given when handling them, as they are armed with sharp teeth, and can give one a nasty nip in double-quick time.

The Spotted Goby is one of the tenants of the pool which we had in mind when referring to the manner in which some fish harmonise with their surroundings. The best way to see this creature is to lie flat down and peer right into the water. Be patient, and you may then be rewarded.

Like the Stickleback of our streams, the Goby builds a nest, and if you are fortunate enough to discover this as well as the owner, then you may congratulate yourself that good luck has come your way. An empty shell is used as a foundation for the nest, and in this the male Goby, which is quite a clever builder, constructs a home by means of sand and a sticky substance which it smears over it so as to make the mortar "set." Having built the house, the next thing is to make an entrance to it; this takes the form of a little tunnel through which the owner can go in and out just as it pleases.

But all is not yet complete, for the Goby seems to realise that it is necessary to protect its nest still further; it therefore takes the precaution to cover the outside of the shell with sand, thus making it much more difficult of discovery.

When the female Goby is inside the nest the male keeps jealous guard outside, somewhat after the fashion of the

a. Brittle Starfish b. Sun Starfish
c. Five Fingered Starfish

GANNETS

KITTIWAKE GULL

" Soldier " Stickleback of our streams; but when the baby fishes are hatched the male swims away and leaves the tiny creatures to take care of themselves.

If there are stones at the bottom of the rock pool gently remove some of them, and keep a sharp look-out for a rather ugly little fish which goes by the name of Father Lasher, or Bullhead. It is dressed in a suit of brown and green, and the skin is made up of various markings, such as bands, circles, and spots. It has the power of changing its colour from light to dark, or dark to light, according to the surroundings it frequents and this, of course, is a splendid means of protection.

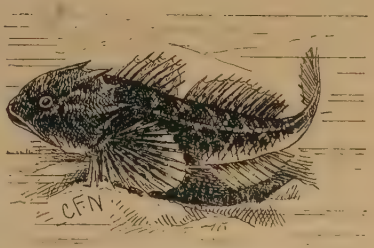


Fig. 17. Father Lasher.

Father Lasher has a large mouth, which is furnished with strong jaws and teeth, and he secures food by hiding under a stone until something moves in the pool. When this takes place he makes a dash for it and soon captures it. It may be that the object so quickly secured does not appeal to Father Lasher, and if this be the case he soon throws it out and prepares to go fishing again in the hope of obtaining something more appetising.

Fig. 18. Pipe Fish.

If a stick be thrust in the pool where Father Lasher is in hiding, maybe he will come from under his stone and make a brave attempt to swallow it, and much fun may be got watching his movements.

He is quite a good fish to take home and keep in a salt-water aquarium, for he may be handled with safety, in spite of his efforts to frighten one by raising his fins and puffing out his gills.

On the underside of his body Father Lasher is most beautifully coloured, being either pale yellow, white, or bright green, marbled with darker colours.

Yet another little inhabitant of the rock pool must be mentioned, and that is the Pipe Fish. It is a long, thin species, and although it has jaws of considerable length, they are fastened together in such a way that the owner cannot open them, and has to suck up food by means of a small hole which will be found at the tip of the jaws.

In many ways the Pipe Fish is a most interesting species, not the least of which is the curious bag or pouch which the male has under his body. The female deposits her eggs in this pouch, and the male carries them about with him until they hatch. This, of course, is a reversal of the usual order of things, for you all know that the mother is nearly always responsible for the rearing of her children.

CHAPTER VIII

STARFISH AND JELLYFISH

FIVE-FINGERED STARFISH—SUN STARFISH—BRITTLE STAR—JELLYFISH—SEA GOOSEBERRY

NEARLY every girl and boy has found the Five-Fingered Starfish stranded upon the beach by the sea, or perchance it has been discovered moving slowly about in a pool at low tide. True, when found stranded upon the shore it looks a sad object, devoid of life; but its movements in a pool, although slow, are always interesting to watch.

Its true home is in the depths of the sea, but the Starfish is often washed ashore when a storm is raging, and on some parts of our coast it is very common indeed.

It may cause some surprise to learn that the Starfish feeds upon shellfish and other creatures of the sea; indeed the young observer will probably find it difficult to discover that it has a mouth.

Of reddish colour, with five arms which go to make up the " star," and a small red eye at the tip of each arm, the common Five-Fingered Starfish is really a wonderful creature, and if the underside be examined the mouth will be found in the centre where the five arms meet. Sometimes a specimen will be discovered which has only three or four large arms with one or two smaller ones. The fact is that each arm, although appearing as a part of the whole body, has an almost separate existence. It has its own blood-vessels and nerves, and if one be lost, the Starfish makes haste to grow another. This it is well able to do.

How does the Starfish move about? It does not possess any fins, and certainly cannot swim. A close inspection of the underside of each arm will reveal small, soft tube-like feet, on each of which there is a sucker. When the Starfish wishes to go for a walk it attaches some of these suckers to an object in the sea and then draws its body gently forward. Evidently it is a believer in the motto of " Slow but Sure! "

Another kind of Starfish which may perhaps be discovered by the seashore has twelve or more arms, instead of five. Because of its colour it is called the Sun Starfish, and the arms radiate like the rays of the life-giving sun. Purplish-red blotched with white is the usual colour. A careful search, however, will reveal other specimens which are red, or orange, and very beautiful they look when seen

in the water. If you happen to be in a boat, where the water is clear and the sea-bottom can be nicely seen, you may notice how the Sun Starfish lights up its surroundings with its bright colour, whilst the delicate ferny sea-weeds as well as fishes, sea urchins, corals, and other creatures all help to make the sea-bed look like Fairyland.

The Sun Starfish resembles its cousins, the Five-Fingered and the Brittle Star, in being able to grow a new arm, or finger, if it happens to lose one or more; if its body is cut in two it soon decides to make the best of matters, for in a little while two animals exist where formerly there was only one!

Some Starfish have eyelids, as well as eyes, and it is a bonny sight to watch the wonderful creatures opening and closing their eyes. A magnifying glass should be used, or the remarkable structure of these creatures of the deep will not be seen to advantage.

Perhaps you would like to know where the Sun Starfish lays her eggs, and how she manages to hatch them? You probably were not aware that the female deposits her eggs in a little heap, and bends her rays over them so as to keep them warm and to protect them. In other words, she does her best to sit upon them until they hatch, and very curious the mother looks when thus engaged.

One day when you are taking a walk along the shore you may be fortunate enough to find a Starfish which is much more delicately built than either of the two whose acquaintance we have already made. Its name is the Brittle Star. The centre of the body may be compared to the piece of wood round which a Catherine wheel is manufactured; the feathery arms always remind us of one of those favourite fireworks when set in motion on November 5th.

It is a poor comparison, no doubt, but it will help you to be on the look-out for the new specimen of which you are in search.

These Brittle Starfishes have long arms which are of delicate structure, and, unlike those possessed by the two species previously described, they are moved about rapidly, and enable the Brittle Stars to make their way through the water much more quickly than their less fortunate relations.

Search should be made for a specimen of the Brittle Star under stones close to the water's edge, but be very careful how you handle the creature, for very often as soon as it is touched it shatters all its arms to pieces, whilst the observer stands spellbound! The reason the Brittle Starfish decides to shatter its arms to pieces in this way is for the purpose of protection, for the person who is attracted by such a wonderful sea creature, and wishes to possess it, very often decides to pick it up. But he little suspects what is going to happen, and finding the Brittle Star has become broken into many parts, he passes on his way disappointed. In the meantime, the central part of the body of the Brittle Star has managed to secure a hiding-place, and remains concealed until it has grown some new arms and is able to resume its journey again.

The common Brittle Starfish is a beautiful object, if only it can be captured entire, for it varies in colour a great deal, specimens that are brown, yellow, violet, red, or grey being forthcoming.

When we come to the Jellyfish we meet with marine animals of a very different kind, and, to say the least, they are not creatures which admit of close study. To see them at their best one must watch them swimming about in the sea, though, true enough, both small and large ones may

often be discovered upon the shore, more especially after there has been a storm.

We remember finding one day on Filey Beach in Yorkshire a number of large brown Stinging Jellyfish which had been washed up from the sea. The shore was quite covered in places with the masses of brown jelly which reminded us of large pancakes. There had been a heavy storm at sea, and these huge Jellyfish had been cast adrift and were washed ashore to die. There was no escape for them, as, being almost entirely composed of sea water, the sun soon dried them up and escape was out of the question.

Fig. 19. Stinging Jellyfish.

To pick up a Jellyfish is attempting the impossible, and it looks a sorry object, but when in the water the movements are decidedly graceful, the umbrella-shaped body being spread out and arched in a most beautiful way.

When a number are thus seen, and it is not uncommon to find several of them close together, the sight is one not easily forgotten. Should the very lovely Sea Gooseberry Jellyfish be discovered, the observer will probably be delighted that such an opportunity to observe one of the sea's most wonderful creatures has come his way.

The Sea Gooseberry Jellyfish is shaped something like the fruit of the Gooseberry bush, but it is, of course, an animal and not a plant; it bears at the end of its body delicate streamers like those one sees on a boy's kite.

When seen swimming in the sea these creatures appear like small opal bells, or fairy lamps, and if only a peep can

a. One-Spot Goby *b.* Black Goby

a. Limpets
b. Mussel
c. Whelk
d. Cockle

be obtained in clear water of a few of the many creatures that inhabit the sea, an idea will be gained of the wonderland in which we live, but which we often pass through blindly because we will not use our eyes.

CHAPTER IX

SHELLFISH

LIMPET—PERIWINKLE—WHELK—COCKLE—MUSSEL—OYSTER

Some kinds of Shellfish have only one shell. Familiar examples are the Limpet, Periwinkle, and Whelk. Animals which have one shell only are called *Univalves*, and some of these live on land as well as in the water. The Garden Snail and the Snails found in our hedgerows are Univalves in the same way as are the Limpet, Periwinkle, and Whelk.

There are other kinds of Shellfish which possess two shells. Familiar examples are the Cockle, Mussel, and Oyster. Animals which have two shells are called *Bivalves*, but it should be noted that *no Bivalves are found on land, for all of them live in either fresh or salt water.*

Let us, then, have a ramble by the seashore in search of specimens of these Univalves and Bivalves, and if we use our eyes we shall, no doubt, be successful in discovering all those which have been mentioned. We will deal with the Univalves first, and in the order set out.

Limpets will be found on the rocks or attached to stones, and you may soon be sure that you are on the right track of these creatures if you look at the curious little home which they build. One boy once compared the conical shell

of the Limpet to a stone "tent," and it always struck us that this was a very good description.

There are more than one hundred different kinds of Limpets scattered throughout the world, and some kinds are found in both fresh and salt water. The specimen we are to look out for is called the Common Limpet, and on some parts of our coast it well deserves the first part of its name.

If you try to pull a Limpet away from the rock to which it is so firmly attached, you will find that the task is not so easy as it looks; the creature seems as if fastened to its resting-place with strong glue and refuses to be dislodged.

A splendid time to go Limpet-hunting is between high and low tide, for at high tide the Limpet wakes up and commences to search for food. As soon as the tide starts to ebb again, the Limpet ceases to feed, crawls slowly back to a rock, and becomes firmly anchored again.

If we are successful in pulling a specimen away from the rock to which it is attached, we shall find that the soft body of the owner is beautifully protected by the shell, for only the bottom of it is open. To examine the body carefully one must watch the Limpet moving about, and as it is very indisposed to go through a performance especially for one's benefit, patience must be exercised.

As in the case of the more familiar Snail, the Limpet has tentacles, or feelers, and at the tip of these the small eyes are to be seen. The foot is as large as the edge of the shell, and by means of it a hole is gradually scooped out on the surface of the rock, so that in time the shell fits into a groove, thus making it still more difficult to be pulled away.

The Limpet feeds, for the most part, upon sea-weed, and it has a wonderful tongue upon which there are no less than 160 rows of minute teeth, twelve tiny teeth in each row. Now, if we do a simple multiplication sum, that is,

multiply 160 by 12, we find that this tenant of the shore possesses 1920 teeth, a fact which will, no doubt, cause some amount of surprise.

Where the beach is composed of shingle, or where rock pools abound, there search may be made for the Periwinkle. Unlike that of the Limpet, the shell is composed of different stories which taper gradually towards the top. Each whorl represents, as in the case of the Garden and Hedge Snails, a year's growth, so that if you count these carefully you should be able to tell how old your specimen is.

Fig. 20. Periwinkle.

We may correctly call these Periwinkles Sea Snails, and they are very common both in cold and warm seas. Sometimes they can be found in immense quantities, for they are very social creatures, and they are vegetarians. The ribbon-like tongue is armed with a large number of teeth, and these enable the creature to cut up its food into tiny pieces before swallowing.

You do not need to be reminded that Winkles have a dark shell, and that the soft body is protected at the entrance by a hard lid. Nor is it necessary to refer, except in passing, to the use made of the Winkle as an article of food.

The empty shell of the Whelk is a very common object by the seashore, whilst the living inhabitant may soon be found wherever rocks abound.

The twist in the shell is nearly always from left to right, that is, if one first looks at the small point, and counts from there to the large open end.

The usual colour of the shell is yellowish, and it often attains to a large size.

When walking along the shore in Spring, or even later, perhaps you may come across a curious dry cluster of objects about the size of a cricket ball, which reminds one of honeycomb or dry sponge. When the wind blows, the light cluster of objects is hurled along the sands, whistling as it goes on its journey. This, then, is the egg cluster of the Whelk, which is often washed ashore, and if you examine each little pearly case you will find inside several small yellow eggs. There must be hundreds of eggs in one cluster, but all of these do not hatch out, because the first young ones that are born commence to feed on the unhatched eggs, and it is stated that only a few young Whelks emerge alive from the hundreds of eggs that are laid in each batch. Hence the necessity for the mother Whelk to make provision for enormous waste.

Having had a peep at three *Univalves*, we may now search for examples of *Bivalves*, and we shall soon discover a specimen of the well-known Cockle. Each of the two shells is the same size, and both are ribbed in a very beautiful way. It is of little use searching for Cockles along a rocky shore, for they are dwellers in mud and sand. They burrow into the mud very quickly and there secure food. They can rise to the surface with equal speed, and this is accomplished by means of the large foot.

We have watched the Cockle gatherers at work on a muddy coast at low tide, and it is interesting to notice the men, women, and children catching them, the Cockles being hidden underground. One Cockle gatherer on the East coast used to search for these creatures bare-footed, and by thrusting his foot in the mud he often pulled it out with a fine Cockle attached to his big toe! We wonder how many of you would like to catch Cockles in this way?

Where there are old piers, posts, walls, stones, or other

objects which have long been washed by the waves, there, sure enough, Mussels may be found in plenty. The dark blue-black shells are a great feature wherever there are piles of wood, pier posts, and other objects, and crowds of Mussels may be found all living close together.

You will notice how splendidly the two edges of the shell fit on to each other, and how difficult it is for any creature to open them unless possessed of great strength.

The Mussel is attached to an object by what is called a byssus, a series of beard-like growths which manage to anchor it fairly securely.

Not only is this familiar inhabitant of the sea valuable as food for mankind, but it provides splendid bait for fishermen; where the tide comes in strong, and there is much wear and tear on piers, breakwaters, and posts, the presence of countless numbers of Mussels helps to preserve those and other objects from damage.

Fig. 21. Oyster.

They are also much relished by various kinds of sea-birds, which sometimes fly high in the air with one and drop it on to stones, or rocks, before attempting to get at the soft body inside.

It would not be fair to leave the Oyster out of our story, though, true enough, only the empty shells are likely to be discovered, for these animals do not, indeed cannot, come ashore, and are protected and preserved in Oyster beds, as they are very valuable as an article of diet.

Unlike the Bivalves we have already seen, the Oyster has shells which are not alike, for the lower shell is large and hollow, and the upper one is almost flat. The shells of the young Oyster, however, are almost round, but as the

animal's body increases in size they become much more flattened.

Once it has become attached to an object the Oyster is settled down for life. It has not got a foot, or any other means of moving about, the only apparatus it possesses being one by which it is able to open and close the front door. It should, however, be stated that when the baby Oysters leave their mother, and this they do in a cloud, for they are so minute, they do possess swimming organs, which are made up of very fine hairs.

The little Oyster soon grows out of recognition, and enlarges its shells by placing round the margins a fine substance which eventually hardens into shell, the latter being mostly composed of chalk.

Unless cultivated, it takes an Oyster from five to seven years to grow up, and, as you probably know, valuable Pearls are obtained from the inside. We wonder if you know, however, how a Pearl is made? Briefly stated, the explanation is that a grain of sand, or some similar object, gets inside the shells of the living Oyster, whereupon the Oyster covers it over with a material called nacre, which is what the beautiful inside lining of the shell is made of. This, in course of time, forms a Pearl.

The Oyster has, like all other creatures, a good many enemies. The Mussel is one, for it loves to sleep in the same bed as the Oyster and often suffocates it; the Five-Fingered Starfish sucks the Oyster's body quite dry, and the crafty Whelk makes a little hole in the shell and does the same thing.

CHAPTER X

MISCELLANEOUS INHABITANTS OF THE SEASHORE

ACORN BARNACLE—STRAWBERRY SEA ANEMONE—SHORE CRAB —HERMIT CRAB—PEA CRAB

THERE is a large number of inhabitants of the sea and seashore which we have not yet discovered, and even when our present ramble is concluded much will remain to be done. But our idea is to encourage the young naturalist to search for marine objects on his own account, and we only pretend *to point the way*.

Let us, then, on this final excursion find out something of interest among the many other creatures which make their home either in the sea, or its immediate vicinity.

Do you remember seeing, when we were looking at the Limpets on the rocks, a number of small brownish creatures which had a little house formed somewhat like the stone tent of the Limpet? But instead of coming to a point, the smaller animal appeared to have a slit in the top and was not wholly enclosed.

Some people are of opinion that these Acorn Barnacles, as they are called, should be included among the Shellfish, but others accord them a place with the Crustacea, or Crabs and Lobsters. Therefore, with us, they are included among the miscellaneous inhabitants of the seashore, and then we are not likely to go wrong.

Even on some of the shells of the Limpet and the Whelk these Acorn Barnacles are found to be attached, so that they can be carried about without any exertion on their

own part. Is not this a capital way of having a ride without taking a ticket?

The chief item of interest concerning these creatures is the method they adopt for procuring food, or, in other words, how they go a-fishing.

The slit to be seen in the " lid," as we may call it, contains within it six pairs of delicate hair-like feet which are thrust out in wavy fashion when the Barnacle is hungry and the tide has come in and covered it. As a result of the current set up by the motion of the feathery feet, small particles of food are collected and conveyed to the mouth. When the Acorn Barnacle is a baby it has only three pairs of legs instead of six pairs. It has only one eye, and there are thin shields upon its back which are sufficient to protect it from numerous enemies which are always ready to pounce upon it. The young one is able, and willing, to move about in the water quite readily, but, in course of time, it changes its " coat," and at last decides to fasten itself to an object of some kind by means of suckers which become firmly attached. Then it remains thus during the remainder of its life.

Fig. 22. Acorn Barnacles.

When enjoying an excursion among the rock pools you are almost sure to discover what look at first sight like small blobs of olive-green, yellow, and red jelly. If the tide

a. Strawberry Anemones *b.* Hermit Crab
c. Shore Crab

is out, the blobs certainly look very inactive, but if you go closer to the water's edge, or peer into a rock pool, you will be surprised to notice how different the blobs of jelly are. As a matter of fact, these jelly-like objects are Sea Anemones, and they are animals and not plants.

To see a Sea Anemone fishing for food in a clear rock pool, with the sun casting its rich glow in the water, is a sight every lover of the seashore should make a point of seeing. The inactive blob of jelly has now become transformed into one of the most beautiful creatures which the sea yields, and, if you get as close as you can to the spread-out body of the Anemone, you will be able to see the numerous tentacles with which the animal procures food. If you touch one ever so gently you will find that the creature is quite sensitive, and withdraws its tentacles inside the soft case. It would never do for it to allow them to be injured, or the means it has for securing food would be seriously interfered with.

The commonest species likely to be found by the young observer is the Strawberry Sea Anemone, and whilst it is perhaps less like a Strawberry than like an Anemone, that it is a very beautiful creature all who have a love for Nature's wonderful sea children will agree.

What the Sea Anemone does is to draw into its mouth through the tentacles small pieces of animal food. It then sucks the juice out, and casts away the disused portion. Try the experiment of feeding the Sea Anemones in the rock pools by offering them small pieces of food, such as a Whelk, Shrimp, Winkle, or other soft-bodied creature cut into bits, and then you may congratulate yourself that you have done a good turn to one of the sea's most wonderful inhabitants.

There are many other kinds of Sea Anemones to be found

round our coast, and some of them are very clever in hiding their bodies among stones, sand, and other material. The one mentioned, however, will be sufficient to make a beginning with, and we shall be surprised if its beauty and interest does not set you on the hunt for further treasures.

The Crabs will, of course, engage your attention, and there are three kinds which ought to be discovered. One is a fairly large one, which is known as the Shore Crab; the second makes its home in the shell of another animal, and is thus called the Hermit Crab; and the third species is no larger than a threepenny piece, and is known as the Pea Crab. The large Edible Crab keeps to the open sea, and does not come within range of our observations.

The strong armour with which the soft body of the Crab is encased is too well known to need a detailed description, as also the long feelers, claws, and legs. A nasty nip may be given to the too venturesome boy or girl who handles a Crab, but fine fun may be obtained watching the animals scuttle across the shingle as if they were walking on short stilts, or as they ingeniously contrive to bury their bodies in the wet sand.

Perhaps you may be fortunate enough to find a Shore Crab which has cast off its old body covering, for, when the shell is not large enough to encase the body, the crab decides to have a new suit of clothes. If it has only just thrown off its old garments, then the whole of the body will be found to be quite soft, but a new suit is soon put on and the animal is again secure from its enemies.

If you watch a Shore Crab in a pool you will see that it sets up a current in the water, having a special apparatus by which this important operation may be performed. The Crab does this so as to be able to breathe, otherwise it would surely die from suffocation.

Crabs lay a large number of eggs, the edible species producing as many as 20,000. They are yellow or red in colour, and quite tiny. Unlike the eggs of most creatures which live in the sea, those of the Crab are not laid and taken no further notice of by the parent, but the mother Crab carries them about with her wherever she goes, until such time as they hatch. They are attached to little hairs which the female Crab possesses near her " tail," and it will interest you to know that the young Crab passes through a somewhat similar series of stages in its existence as the young Frog. First there is the egg; then the Crab tadpole with a long tail; then another change, with still a long tail; and then the perfect little Crab with no tail at all.

When searching for Whelk shells be careful how you pick them up, for it is more than likely a Hermit Crab may have decided to make its home in the shell, and you will get a nip for being so rude as to disturb it.

Unlike other Crabs, the Hermit has not got a hard body covering all over, for it is soft and unprotected on the hind parts, and it is very necessary that it should adopt some method whereby it may be better protected. Empty shells of the Whelk are very favourite homes which the Hermit Crab often decides to take possession of, but it will also attack a living Whelk, pull out the owner, eat him up out of the way, and then force its body into the Whelk's cosy parlour.

The front parts of the Hermit Crab are quite hard, so that no harm comes his way when he desires to thrust out those portions of his body, and it is most amusing to see him moving about with a large Whelk's shell attached.

Very small Hermit Crabs may be found inside a shell of some kind, and, needless to say, it is a Univalve that is

chosen, and not a Bivalve, as the former makes a much more secure dwelling-place.

Fig. 23. Pea Crab.

The little Pea Crab is a most interesting species, and manages to exist in spite of its small size. There is little doubt that Gulls and other sea birds feed upon this Crab, and were it not for the fact that it hides its body by burrowing under stones and sand, it would be gobbled up more often than it is.

We cannot fail to be impressed with the fact that, whilst almost all these creatures of the sea and seashore are more or less well equipped for the struggle for existence, they often have to work tremendously hard to make a living, and very frequently devour one another if food is scarce and their hunger has to be satisfied at all costs.

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